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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,921	01/17/2001	Gary W. Scott	NBD-46/47181-00193USP1	5556

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EXAMINER	
WEST, JEFFREY R	
ART UNIT	PAPER NUMBER
2857	

DATE MAILED: 01/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/761,921	Applicant(s) SCOTT, GARY W.	
	Examiner Jeffrey R. West	Art Unit 2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *21 November 2002* is: a)☐ approved b)☒ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Priority

1. The applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows:

> The second application must be an application for a patent for an invention which is also disclosed in the first application (the parent or provisional application); the disclosure of the invention in the parent application and in the second application must be sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ 2d 1077 (Fed. Cir. 1994). The disclosure of the 09/426,832 application does not provide sufficient support for the instant invention because there is no current sensor operatively associated with a pair of substantially identical parallel insulated load conductors for each zone in which arcing is to be detected.

Drawings

2. The drawings are objected to because they do not have sufficiently descriptive Labels, specifically boxes "34", "34A", "43", and "35". Blank boxes in drawings should be labeled descriptively unless it is a well-known component. A proposed drawing correction or corrected drawings are required in reply to the Office Action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 9, 13, 14, 17, 25, 29, and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,986,860 to Scott.

Scott discloses a method and corresponding detection system for detecting arcing faults in a defined zone of an electrical circuit comprising splitting a conductor in each said defined zone into a pair of substantially identical parallel insulated conductors, thereby defining a detection zone comprising the length of said parallel conductors between end points where the two conductors are coupled together, providing a current sensor (i.e. toroidal transformer current sensor) operatively associated with each said pair of parallel conductors, and configuring and arranging the current sensor and said conductors such that the current sensor produces a signal representative of a difference in the current flow in the two conductors (column 3, lines 25-40). Scott also discloses that the current sensor comprises a di/dt (i.e. time derivate of current) air core toroid (column 10, lines 26-29), a figure-8 shaped core (column 9, lines 6-11), or at least a magnetic core, provided with a wound coil, coupled with the conductors in such a way that the currents travel in

opposite directions, and therefore it is considered inherent that the magnetic fields will also oppose each other (column 8, lines 35-41). Scott discloses an arc fault detector, operatively coupled with the current sensors, that produces a signal indicating an arc fault which is supplied as a trip signal to trip a circuit breaker (column 7, lines 23-41), a RC shunt filter to mask the effects on di/dt due to different load power factors (column 10, lines 53-63), and an over-pressure relay to detect faults to ground (column 12, lines 48-52). Scott also discloses that during differential phase current arc detection the detection zone is defined by a pair of identical parallel insulated conductors that each carry a load current (column 8, lines 23-41).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott.

As noted above Scott teaches many of the features of the claimed invention including a transformer current sensor with a magnetic core but is silent on the permeability of the core. Although not specifically disclosed it would have been obvious to one having ordianary skill in the art to include a high permeablitly core

because it is well known in the art that to achieve a given inductance without a high permeability core, more and/or larger turns of the coil would be needed and therefore a core with high permeability would have provided a desired inductance using a smaller transformer to meet space constraints.

7. Claims 3 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott in view of U.S. Patent No. 3,914,667 to Waldron.

As noted above, Scott teaches all the features of the claimed invention except for specifying that the current sensor comprise a Hall effect sensor.

Waldron teaches a sensing and tripping means for protecting a circuit against damage from overload conditions and preventing erroneous circuit breaker tripping operations due to transient conditions which may occur during normal operation (column 2, lines 5-11) comprising a Hall effect sensor that produces an output voltage directly proportional to the current flow through a conductor generating a magnetic field concentrated by a magnetic core. (column 2, lines 41-53).

It would have been obvious to one having ordinary skill in the art to modify the invention of Scott to include specifying that the current sensor comprise a Hall effect sensor, as taught by Waldron, because, as suggested by Waldron the combination would have provided a means for developing a voltage signal proportional to the current flow which, when in voltage form, can be used to insure that breaker tripping only occurs when a desired condition is met (column 2, lines 5-19).

8. Claims 4-6 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott in view of U.S. Patent Application Publication No. 2002/0011832 A1 to Berkcan et al.

As noted above, Scott teaches many of the features of the claimed invention including specifying that the current sensor comprise a di/dt air coil toroid or be formed into a figure-8 configuration, but does not teach that the di/dt sensor be of low permeability or that the figure-8 sensor use a Rogowski coil.

Berkcan teaches primary current conductor configurations for a residential electronic meter comprising a current sensor assembly including a sensor coil, an electrostatic shield coil, a toroid core of non-magnetic material, a housing, and a magnetic shield all arranged coaxially about a pair of primary current conductors (0007 and 0008) wherein the sensing coil is a Rogowski coil and the core is an air core (0024). Berkcan also teaches that an air core, such as the core disclosed by Scott, is one of low permeability (0010).

It would have been obvious to one having ordinary skill in the art to modify the invention of Scott to include specifying that the current sensor use a Rogowski coil, as taught by Berkcan, because, as suggested by Berkcan the combination would have given an isolated current measurement using a coil that does not saturate with high fields and has an excellent bandwidth and linearity (0024).

9. Claims 7 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Scott in view of Berkcan and further in view of U.S. Patent No. 6,088,205 to Neiger.

As noted above, the invention of Scott and Berkcan teaches many features of the claimed invention including a RC shunt filter as well as a current sensor that produces a signal proportional to the difference between the time derivatives of the current in two conductors, but does not teach specifying a circuit for integrating and filtering to produce the current signal.

Neiger teaches an arc fault detector with circuit interrupter comprising an AFCI/GFCI circuit including two current transformers consisting of magnetic cores and coils (column 8, lines 61-63) and a toroidal current to voltage transformer (column 9, lines 58-60) wherein the output of the toroidal transformer is input to two separate circuits, one circuit being high frequency comprising a high pass filter, full wave rectifier, amplifier, and integrator, and the second circuit being the AC line frequency circuit comprising a low pass filter, full wave rectifier, amplifier, and integrator (column 10, lines 22-28).

It would have been obvious to one having ordinary skill in the art to modify the invention of Scott and Berkcan to include specifying a circuit for integrating and filtering to produce the current signal, as taught by Neiger, because, as suggested by Neiger, the combination would have provided a method for splitting of the output signal from the transformer into two signals of different frequencies to permit the device to react to different combinations of AC line frequency and high frequency arcing signals and therefore permitted the AFCI circuit to react appropriately to many

different arcing situations (column 10, lines 26-33) with the integrator generating the necessary signal representative of the level of the average peak arc current present on the AC line (column 12, lines 18-20).

10. Claims 8 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott in view of U.S. Patent No. 5,420,504 to Berkcan.

As noted above, Scott teaches many of the features of the claimed invention including a RC shunt as well as a current sensor to determine the difference in current between two conductors, but does not teach measuring the current signal using a current sensor comprising a resistive shunt that produces a voltage difference proportional to the measured current signal.

Berkcan teaches a current measuring system that uses a measurement of voltage for assessing the value of the current (column 2, lines 25-29) comprising a non-inductive current sensor that determines the sensed current using the voltage drop or voltage difference across the resistive shunt between a pair of contact points (column 4, lines 6-11).

It would have been obvious to one having ordinary skill in the art to modify the invention of Scott to include measuring the current signal using a current sensor comprising a resistive shunt that produces a voltage difference proportional to the measured current signal, as taught by Berkcan, because, as suggested by Berkcan, the combination would have provided a sensor that can be used in a three-phase network, or other configuration with more than one sensor employed in close

proximity, while reducing or substantially eliminating the mutual coupling effects that may degrade the quality of the sensor current measurements (column 4, lines 20-35).

11. Claims 10-12, 15, 26-28, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott in view of U.S. Patent No. 5,519,561 to Mrenna et al.

As noted above, Scott teaches all the features of the claimed invention except for a circuit breaker using a bi-metal current sensor and armature that moves (i.e. is attracted) by the magnetic core in response to the current difference.

Mrenna teaches an electrical system protected, by a circuit breaker, that includes a line conductor and a neutral conductor connected to provide power to a load wherein the breaker includes a thermal magnetic overcurrent detector comprising a bimetal connected in series with the line conductor. Mrenna then teaches that persistent overcurrents bend the bi-metal causing it to release a hatch which actuates the trip mechanism as well as that short circuits passing thought the bimetal magnetically attract an armature to release the latch and actuate the trip mechanism (column 3, lines 15-28). Mrenna also teaches an arc detector that sends a trip signal to the breaker in response to the reception of a bandwidth limited di/dt signal a predetermined number of times (column 3, line 62 to column 4, line 2).

It would have been obvious to one having ordinary skill in the art to modify the invention of Scott to include a circuit breaker using a bi-metal current sensor and armature that moves (i.e. is attracted) by the magnetic core in response to the

current difference, as taught by Mrenna, because Mrenna suggests a circuit breaker sensor, applicable as the breaker disclosed in the invention of Scott, that would have produced accurate current measurements inexpensively and without excessive space (column 2, lines 1-19).

12. Claims 16 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott in view of U.S. Patent No. 5,905, 619 to Jha.

As noted above, Scott teaches all the features of the claimed invention except for including a relay, responsive to the differential current, coupled to the circuit breaker for its operation.

Jha teaches an arc fault detection system comprising a circuit electrically connected between a power source and a switchboard, a control power source for a differential current relay, a source current transformer coupled to the electrical circuit between a circuit breaker and the switchboard wherein the differential current relay is electrically connected to the breaker such that when the differential current relay determines a differential current it opens the breaker (column 1, lines 45-62)

It would have been obvious to one having ordinary skill in the art to modify the invention of Scott to include a relay, responsive to the differential current, coupled to a circuit breaker for its operation, as taught by Jha, because, as suggested by Jha, the combination would have provided a current detection system reduces the occurrence of unwanted breaker tripping by only receiving current through the

operating coils when an arc fault occurs and not during normal operation (column 1, line 66 to column 2, line 10).

Response to Arguments

13. Applicant's arguments filed 21 November 2002, have been fully considered but they are not persuasive.

Applicant argues that the instant invention specifies that the two conductors are both "load" conductors while the '860 "patent and certain of the secondary references show two conductors, but only one of them is a "load" conductor, and the other is used to provide a return path". The Examiner contends that U.S. Patent No. 5,986,860 to Scott (the '860 patent) does provide an embodiment for ground fault detection wherein one conductor is a "load" conductor and the second is a neutral return path (Figure 1) but also provides an embodiment for differential phase current arc detection wherein both the parallel conductors support a load (Figure 4 and column 8, lines 23-41).

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey R. West whose telephone number is (703)308-1309. The examiner can normally be reached on Monday through Friday, 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can be reached on (703)308-1677. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7382 for regular communications and (703)308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

MARC S. HOFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

jrw
January 14, 2003